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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/761,594	01/16/2001	Hans-Jurgen Hacke	GR 98 P 4137 P	5815

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LERNER AND GREENBERG, P.A.
POST OFFICE BOX 2480
HOLLYWOOD, FL 33022-2480

EXAMINER	
HARAN, JOHN T	

ART UNIT	PAPER NUMBER
1733	

DATE MAILED: 01/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/761,594	HACKE ET AL.
	Examiner	Art Unit
	John T. Haran	1733

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5 and 11-24* is/are pending in the application.

4a) Of the above claim(s) *11,12 and 18* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,13-17 and 19-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 January 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/23/03 has been entered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-5, 13-17 and 19-24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1 and 3 are indefinite because of the new claim language requiring "a desired level of mechanical decoupling". It is unclear what constitutes the desired level of mechanical decoupling or how the level is determined or measured. It appears Applicant is trying to claim that the level/degree of mechanical decoupling is higher than that of the prior art, however if this is the case it is still entirely unclear how the level of mechanical decoupling is determined or measured.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-5, 13-17, and 19-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akagawa et al (EP 734,059) in view of Farnworth et al (U.S. Patent 6,639,600), Akram et al (U.S. Patent 6,107,109) and IBM Technical Bulletin, "Solder Plated Resin Ball" pages 463-464.

Akagawa et al are directed to a chip sized semiconductor device and a process for making it comprising providing chips (32), placing electrical connection pads on the chip (36), applying a first insulating layer (38) such that the electrical connection pads are left partially uncovered, producing interconnects (40) on the first insulating film leading from the electrical connection pads (36) to a base region (43) of external connection elements; applying a second insulating layer (42) on the interconnects wherein the second insulating layer is thicker than the first insulating layer; forming openings (44) in the second insulation layer above the base regions; and placing solder balls (46) in the openings and attaching them to the base regions. Akagawa et al are silent towards the balls being plastic balls having a metallic coating.

It is well known and conventional in the semiconductor art to use plastic balls having a metallic coating and an outer solder coating in place of pure solder balls

because the plastic is more reliable to withstand thermal stress, as shown for example in IBM Technical Bulletin, "Solder Plated Resin Ball" page 463. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the resin ball of the IBM Technical Bulletin in the method and product of Akagawa et al in order to increase resistance to thermal stress.

Akagawa et al are also silent towards bonding the balls to the base region by placing a conductive material in the opening and attaching the ball to the connection pads via the conductive material. Akagawa et al teach bonding the solder ball to the base region through a reflow process (Column 9, line 3). It is well known and conventional to use conductive material, such as conductive adhesive, to attach balls to a surface in place of a reflow process, as shown for example in Farnworth et al (Column 11, lines 61-64) and Akram et al (Column 7, lines 43-45). The two are alternative expedients and it would have been obvious to use either and only the expected results would be achieved. It would have been obvious to one of ordinary skill in the art at the time the invention was made to place conductive material in the opening and attach a resin ball coated with metal to the base region via the conductive material in the method and product of the Akagawa et al as is conventional in the art as illustrated in Farnworth et al and Akram et al.

Regarding claims 1 and 3 it is noted that the claims do not actually require that the semiconductor component be soldered onto a printed circuit board and have the desired level of mechanical decoupling. The claims require that the semiconductor component be capable of being soldered to a printed circuit board and that there will be

a mechanical decoupling upon soldering to the printed circuit board. One skilled in the art would have readily appreciated that the semiconductor component obtained from the method of Akagawa et al, as modified above, is capable of being soldered to a printed circuit board, in light of the fact that the balls have an outer layer of solder. The product of Akagawa et al, as modified above, has the various claimed properties for the second insulating layer, conductive material, and the small balls and whether specifically selected for achieving the desired level of mechanical decoupling or not, one skilled in the art would have readily appreciated that only the expected results would be achieved upon soldering the component to a printed circuit board, i.e. that there will be the desired level mechanical decoupling.

Regarding claims 2, 17, and 23-24, one skilled in the art would have readily appreciated that the relative thickness of the insulation layers depends upon a variety of factors and that the second insulation layer needs to be sufficiently thick to provide openings of adequate size to fill with conductive material to bond the balls to the chip. One skilled in the art would have readily appreciated that the thickness of the second insulation layer in comparison with the first insulation layer is within the purview of one skilled in the art.

Regarding claim 4, it is notoriously well known and conventional to apply adhesive into openings using a doctor blade and one skilled in the art would have been expected to use conventional mean for introducing conductive adhesive into the openings. It would have been obvious to use notoriously well known and conventional

means, such as a doctor blade, for introducing the adhesive into the openings in the method of Akagawa et al, as modified above.

Regarding claim 5, Akagawa et al teach forming the chips on a wafer and dicing the wafer after the assembly process is complete (Column 9, lines 48-57).

Regarding claims 13 and 19, Farnworth et al and Akram et al teach using conductive adhesive and curing it.

Regarding claims 14-15 and 20-21, completely metal balls, such as solder balls as shown for example in Akagawa and metallized plastic balls, as shown for example in the IBM Technical Bulletin, are both well known and conventional and it would have been obvious to use either.

Regarding claims 16 and 22, one skilled in the art would have readily appreciated that the opening in the second insulation layer of Akagawa et al is circular in shape to accommodate the ball and that adhesive placed in the opening would assume a cylindrical shape. It would have been obvious to one of ordinary skill in the art at the time the invention was made to place conductive adhesive in the opening and thereby assume a cylindrical shape in the method and product of the Akagawa et al.

Response to Arguments

6. Applicant's arguments filed 11/13/03 have been fully considered but they are not persuasive.

As noted above claims 1 and 3 do not actually require the semiconductor component to be soldered to the printed circuit board and have the desired level

mechanical decoupling, but rather require that the semiconductor component be capable of being soldered to a printed circuit board and being mechanically decoupled upon the soldering operation. The product of Akagawa et al, as modified, is capable of being soldered to a printed circuit board, in light of the fact that the small balls have an outer coating of solder. Furthermore, the product of Akagawa, as modified, has the claimed properties of the second insulation layer, the conductive adhesive, and the small balls and whether specifically selected for achieving mechanical decoupling or not, one skilled in the art would have readily appreciated that only the expected results would be achieved upon soldering the component to a printed circuit board, i.e. that there will be the desired level of mechanical decoupling.

Applicant teaches that a comparatively good mechanical decoupling in comparison to the prior art (Akagawa) is achieved through having plastic balls coated in solder because they have greater elasticity than the solder balls of the prior art (Akagawa) and through connecting the balls to the device with conductive adhesive because it has greater elasticity than the reflown solder utilized in the prior art (Akagawa). Applicant also teaches that having the second insulation layer thicker than the first insulation layer contributes to the comparatively good mechanical decoupling.

There is ample motivation to modify Akagawa with the teachings of Farnworth, Akram, and the IBM Technical Bulletin to use plastic balls coated with solder instead of solder balls and to connect the balls to the base region with conductive adhesive rather than through the reflow of solder. Also Akagawa teaches the second insulation layer is thicker than the first insulation layer. While the motivation for modifying Akagawa is not

to improve mechanical decoupling upon connection of the device to a printed circuit board, the process and product of Akagawa, as modified, teaches having a second insulation layer thicker than the first insulation layer, having plastic balls coated with solder, and using conductive adhesive as the conductive material, just as applicant. One skilled in the art would have readily appreciated that only the expected results would be achieved through soldering the device to a printed circuit board, namely the desired level of mechanical decoupling.

Applicant's argument that the combination of references does not establish a prima facie case of obviousness is unpersuasive because as noted above, there is ample motivation to combine the references and more than a reasonable expectation of success of combining the teachings of the references, and as noted above all the claimed limitations are met, including the capability of desired mechanical decoupling, since applicant and Akagawa, as modified, have the same properties identified by applicant to achieve the capability of the desired level of mechanical decoupling. Additionally, the functional features have been given the appropriate patentable weight and are considered met since as noted above, applicant and Akagawa, as modified, have the same properties identified by applicant to achieve the desired mechanical decoupling capability.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **John T. Haran** whose telephone number is **(571) 272-1217**. The examiner can normally be reached on M-Th (8 - 5) and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on (571) 272-1226. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

John T. Haran
Examiner
Art Unit 1733